AIR SERVICE INFORMATION CIRCULAR

(AVIATION)

PUBLISHED BY THE CHIEF OF AIR SERVICE, WASHINGTON, D. C.

Vol. VI June 15, 1925 No. 519

STATIC TEST OF THE ENGINEERING DIVISION EXPERIMENTAL STEEL SPAR

Designed by I. M. Laddon

(AIRPLANE SECTION REPORT)

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Prepared by Edgar R. Weaver
Engineering Division, Air Service
McCook Field, Dayton, Ohio
October 29, 1924

WASHINGTON
GOVERNMENT PRINTING OFFICE
1925

STATIC TEST OF THE ENGINEERING DIVISION EXPERIMENTAL STEEL SPAR

OBJECT

This test was conducted for the purpose of determining the strength of this experimental spar relative to its weight.

DATE AND PLACE

This test was conducted at McCook Field, Dayton, Ohio, October 29, 1924.

WITNESSES

Mr. J. S. Newell.	Mr. D. B. Weaver.
Mr. W. E. Savage.	Mr. E. R. Weaver.

DESCRIPTION

This experimental spar was a modified Warren truss, made of molybdenum steel tubes which were joined by torch welding.

The end and strut point fittings were made of heavy sheet steel and also welded in place.

Figure 1 is a drawing of the spar.

The weight of this spar was 60 pounds, and its length was 20 feet.

PROCEDURE

The spar was attached to an especially constructed jig by the fitting at one end and a heavy steel member which connected the strut point with the jig at a point 45 inches above the inner fitting pin or neutral axis of the spar.

Lateral braces were set up at 45-inch intervals along the spar, and the loads W_1, W_2, and W_3 were applied at distances of 5 feet, 10 feet, and 20 feet, respectively, outboard from the center of the inner hinge pin.

The deflections were measured at 24-inch intervals along the spar.

RESULTS

Figure 2 is a table of the spar deflections and the loads imposed.

This spar supported the designed load without failure, however, when 85 per cent of the required load was on the platforms, the inner end fitting plate showed signs of wrinkling, but did not fail.

The complete failure of the beam came when 105 per cent of the load was on the platform.

Failure was in compression about midway between the jig and the hinge pin fitting, due to axial load.

Figure 3 is a chart showing the deflection curves.

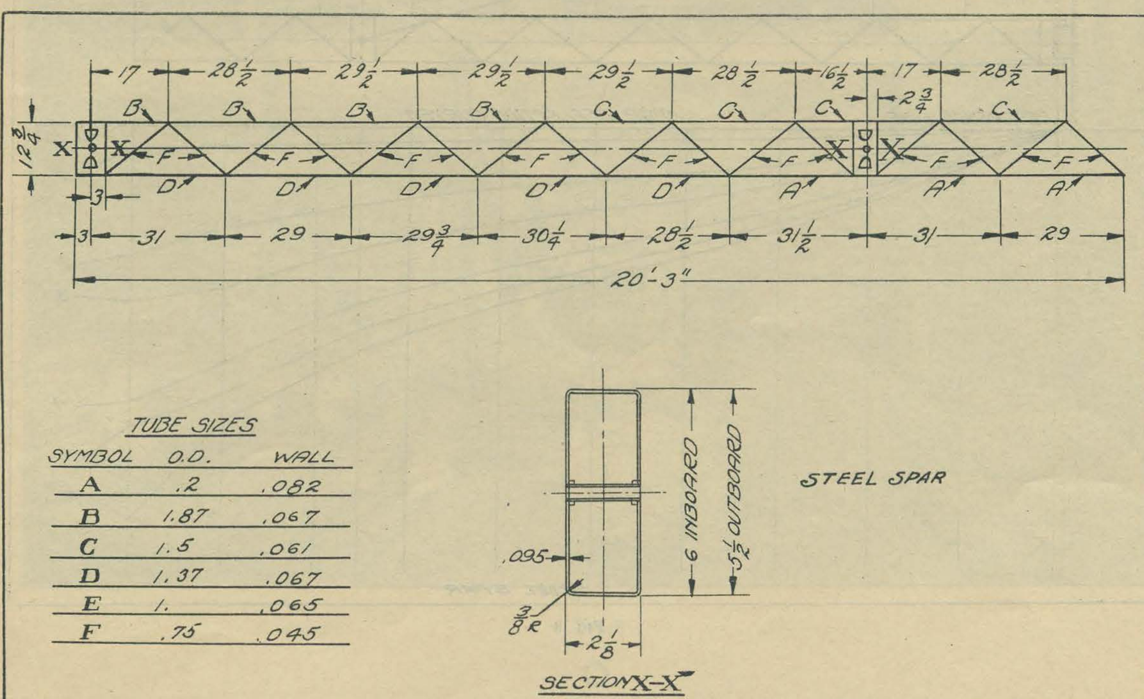
Figures 4 and 5 are photographs of the beam after failure.

RECOMMENDATIONS

Strengthen inner end fitting.

CONCLUSION

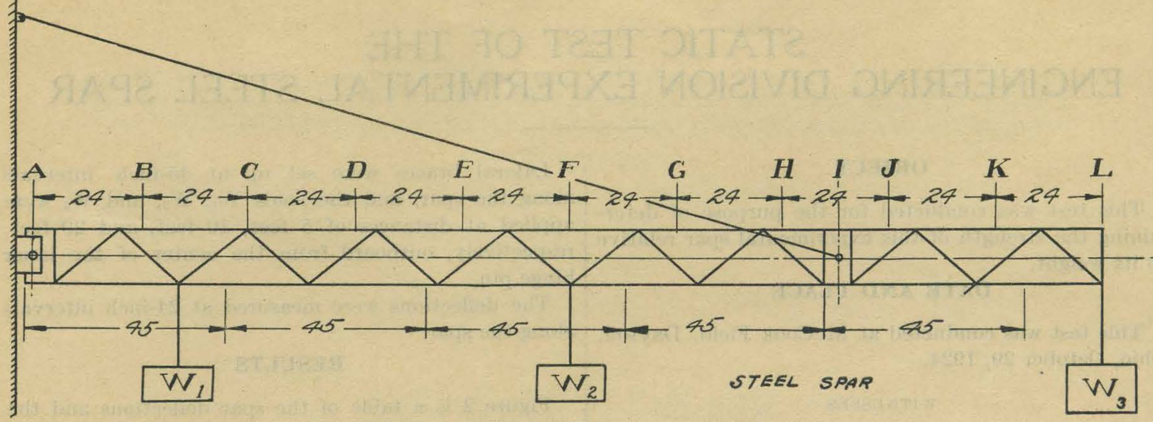
This Engineering Division steel tube spar is structurally satisfactory with the exception of the inner end fitting.



TUBE SIZES

SYMBOL	O.D.	WALL
A	.2	.082
B	1.87	.067
C	1.5	.061
D	1.37	.067
E	1.	.065
F	.75	.045

Fig. 1



SPAR DEFLECTIONS AND LOADING SCHEDULE

Load No.	Deflections, in inches												Load, in pounds		
	A	B	C	D	E	F	G	H	I	J	K	L	W_1	W_2	W_3
1	0.00	0.04	0.06	0.12	0.14	0.17	0.20	0.24	0.25	0.30	0.34	0.36	200	200	300
2	.00	.18	.36	.56	.69	.83	.98	1.16	1.25	1.37	1.64	2.06	700	700	1.050
3	.00	.29	.60	.88	1.11	1.32	1.57	1.81	1.97	2.18	2.63	2.87	1,200	1,200	1.800
4	.01	.44	.88	1.30	1.61	1.96	2.26	2.63	2.83	3.14	3.80	4.50	1,700	1,700	2,550
5	.01	.42	1.03	1.50	1.85	2.24	2.60	3.01	3.26	3.60	4.34	4.89	1,900	1,900	2,850
6	.01	.57	1.13	1.66	2.05	2.47	2.84	3.31	3.60	3.98	4.76	6.37	2,000	2,000	3,000
7	Failure—At 85 per cent load inner end bearing plate wrinkled												2,100	2,100	3,150

FIG. 2

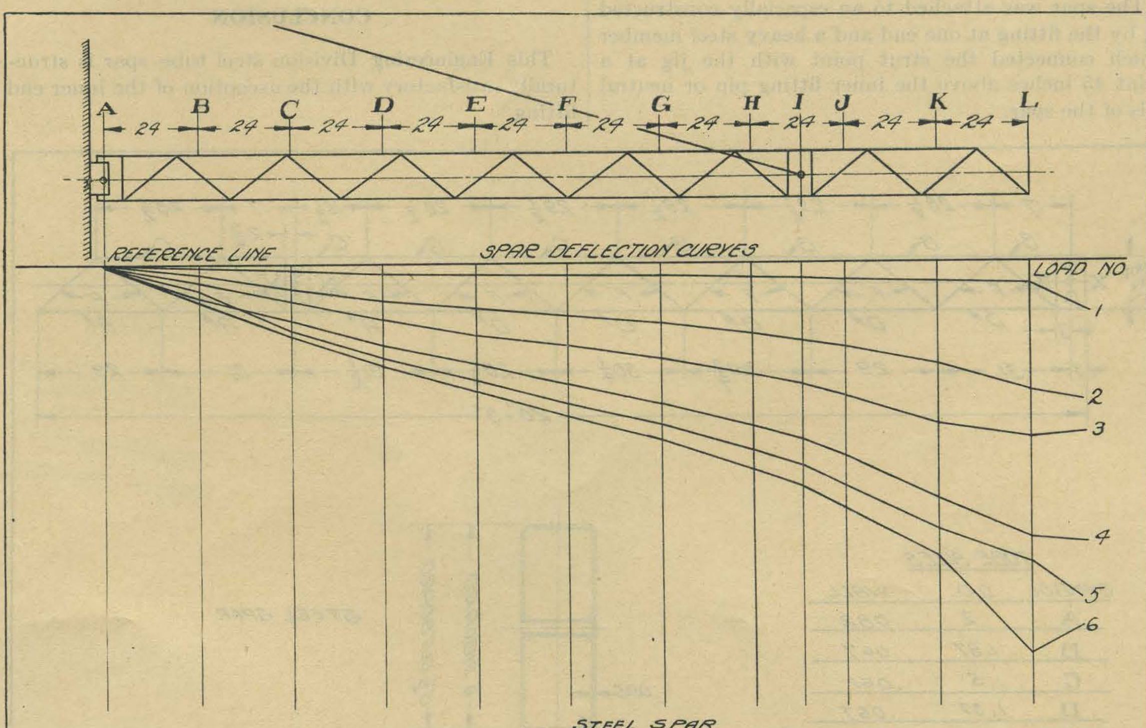


FIG. 3

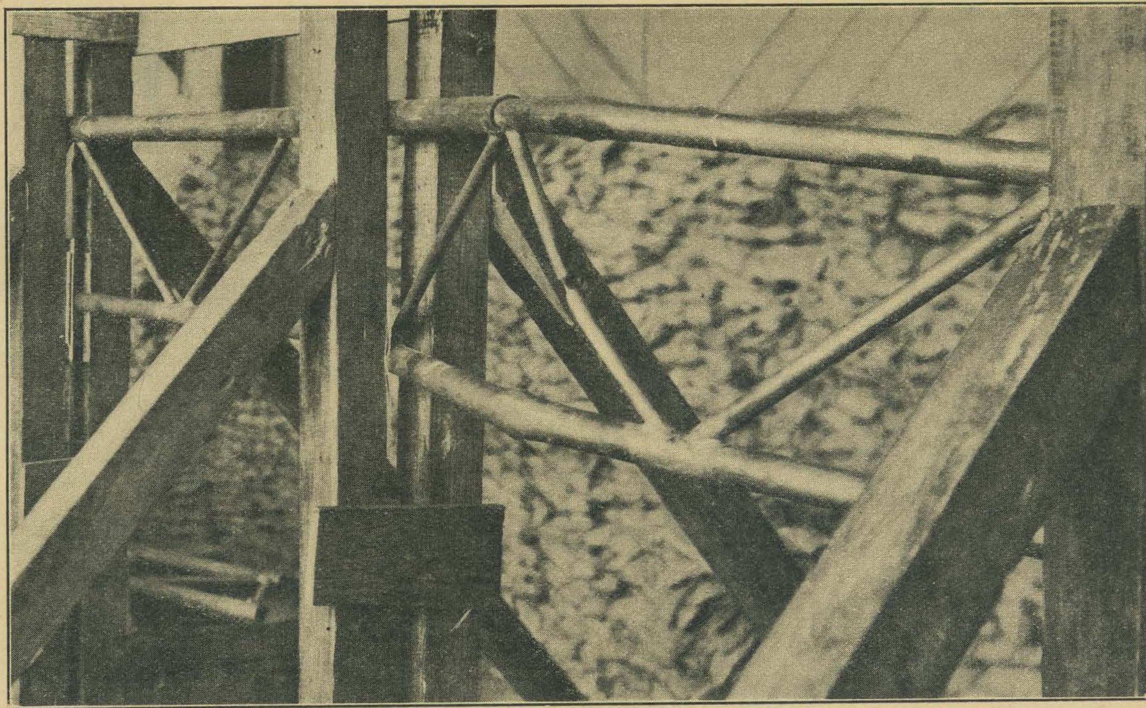


Fig. 4

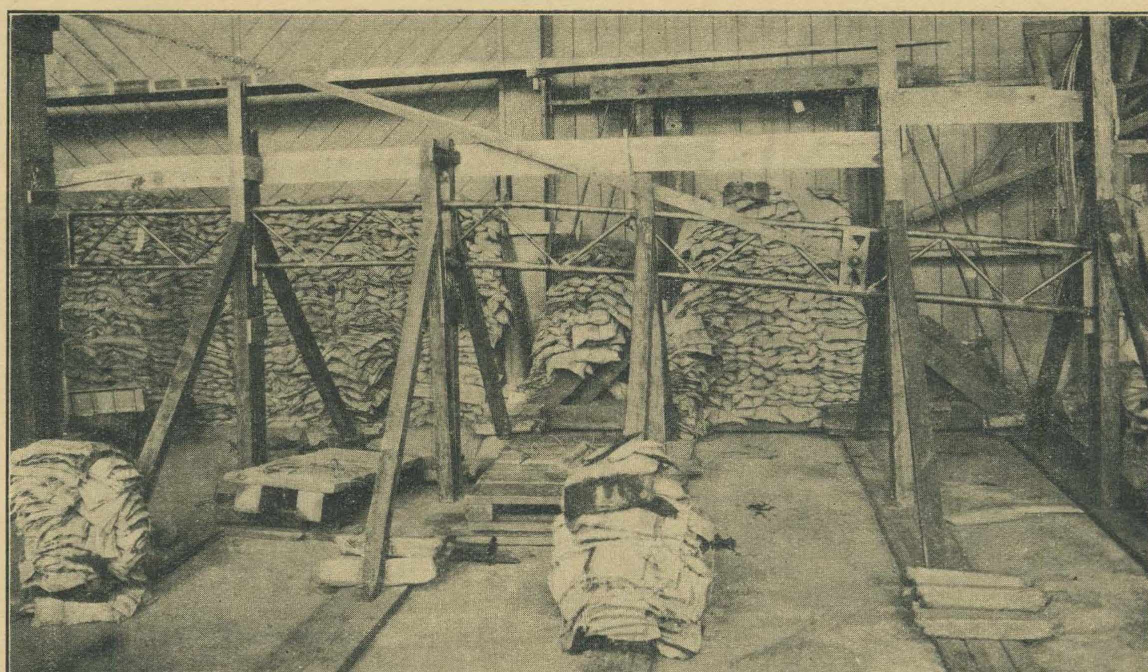


Fig. 5